

G. E. ROHMER & J. F. BOORAEM.

METHOD OF ANCHORING.

APPLICATION FILED APR. 24, 1911. RENEWED DEC. 21, 1912.

1,120,410.

Patented Dec. 8, 1914

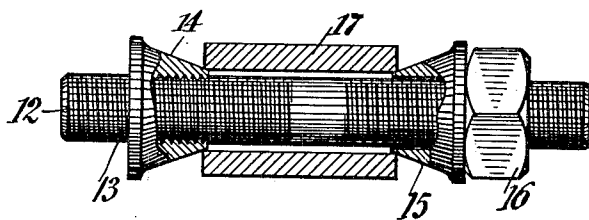


Fig. 1

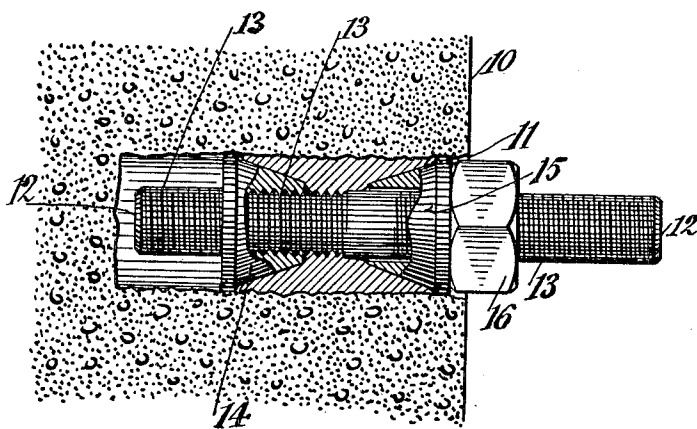


Fig. 2

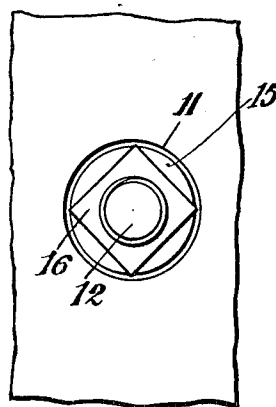


Fig. 3

WITNESSES

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UNITED STATES PATENT OFFICE.

GABRIEL E. ROHMER, OF WOODSIDE, AND JOHN FRANCIS BOORAEM, OF NEW YORK, N. Y., ASSIGNORS, BY MESNE ASSIGNMENTS, TO CINCH EXPANSION BOLT & ENGINEERING COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

METHOD OF ANCHORING.

1,120,410.

Specification of Letters Patent.

Patented Dec. 8, 1914.

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To all whom it may concern:

Be it known that we, GABRIEL E. ROHMER, a citizen of the United States of America, and residing in Woodside, in the county of Queens and State of New York, and JOHN FRANCIS BOORAEM, a citizen of the United States, and residing in New York city, borough of Manhattan, county and State of New York, have invented a certain new and useful Method of Anchoring, of which the following is a specification.

This invention relates to anchorages and to those which are usually termed expansion anchors, which as is well known are devices in which two or more members, so co-operate that one member moves another member normally smaller than the hole in which it operates, into such a position and shape as to be within the hole and press against the walls and thereby engage the same in such a manner as to withstand the pull on the members.

The invention relates more particularly to an improvement in the art and in the method employed and the principle underlying the same.

Both these members were usually of a hard material whereby the pressure was transmitted by one member to the other, or in case one member was of soft material it was only sufficiently soft to yield slightly when under great pressure and was not restrained or confined between surrounding members. In all such prior devices, the weakest member would of course break first and this usually resulted in the slipping of the entire unit out of the hole or the breaking of that member holding it therein. Usually also these holding-members have only a point-contact or a "line-contact", whereby the resistance offered to the piece is a comparatively limited one.

Our invention consists in the application of a soft metal under complete restraint and under continued extreme pressure to an anchorage unit, so arranged and coöperating with the members of the anchorage unit so that the more the unit is pulled, the greater is the hold obtained. since the soft metal molds itself when confined and under pressure to take up the force applied and forms so to say part of the operating members, by reason of being moldable and

always confined and under complete restraint.

It is well known that soft lead is ductile, malleable and viscous, at the same time incompressible. It is these characteristics which we utilize. With extreme pressure applied and consequent change of form under the influence of a deforming force, the lead will flow much like a fluid and be capable of movement in every direction, and capable of transmitting shock equally throughout its parts. The lead when thus subjected to extreme continued pressure while under complete restraint is so manipulated as to press against all parts in contact therewith and by reason of the extreme pressure on the lead while under confinement it will become for all practical purposes one with the several parts. This is obtained by reason of the pliability of the lead in acting like a fluid when under pressure and confinement and creeping into all interstices of the hole to which the anchorage unit is applied, and also molding itself against the bolt and the compressing members coöperating therewith. The continued and increasing pressure subjects the lead to a compression under constraint whereby it acts like an incompressible solid or an incompressible liquid, except that it will not leak like oil or water. It retains increased efficiency in resisting shear because of the restraint it is under. Any strain to which the lead is subjected is transmitted throughout its entire volume and is dispersed from the parts that produce the strain through to every molecule.

In the accompanying drawings Figure 1 is a perspective view of the bolt and its washer prior to the use of it, Fig. 2 is a sectional view, showing the washer when in use, and Fig. 3 is an end-view of Fig. 2.

There is shown a manner in which we utilize the property of the lead to the useful purpose described in which the wall to which the member is to be applied has the hole therein. The bolt is screw-threaded at 13 and engages a forming member 14 while another forming member 15 rides loosely on the bolt and abutting against a screw-threaded fixed nut 16 engaging the screw-threads 13. The outer diameter of both of these members is the

diameter of the hole allowing only sufficient clearance for the entrance of the members in the hole so that they form dams to prevent any leakage of the soft metal. Between the two members 14 and 15 we provide a layer of soft metallic metal, lead for instance, which may be in the form as shown in Fig. 1, and for instance, as a cylindrical collar 17 surrounding the bolt 12 and intermediate the members 14 and 15. Any shape may be given to this layer, it being essential that the volume of it should be substantially equal to the volume between the members 14 and 15 when in their final position. These members so operate that the lead therebetween is caused to be moved and subjected to pressure which continues until extreme pressure is reached, during all of which time all of the lead is under complete restraint. This is done by revolving the nut 16 while the bolt 12 is maintained stationary. When the members 14 and 15 arrive at the position corresponding to extreme compression of the lead therebetween, the lead has been forced into all the interstices of the hole in the wall and against the inclosing members and bolt and being all the time under complete restraint, the walls of the hole, the compressing members of the unit, and the bolt form, so to say, a single member or a single piece, the lead so molding itself to the parts as to be substantially integral therewith. The external load is thus equally distributed and full cylindrical surface contact is obtained, the soft lead causing the combination of parts to act much like a hydraulic press. The maximum force of the screw which is limited only by the tensile strength of the bolt being diverted by the sloping wedge-like surface of the forming members, the lead is forced radially upon the inner surface of the wall with an equal pressure distributed over a smaller area, hence a greater pressure per square inch is obtained, thus increasing the friction between the lead and wall, since the greater the normal pressure the greater the friction. During all this time, the dams or flanges prevent leaking and the distribution of the pulling load upon an infinite number of cylindrical planes concentric to the bolt, reduce the tendency of the lead to shear to a minimum, preventing thereby the shearing strain to be focussed at one cylindrical plane substantially concentric to the bolt.

We have described soft lead and it is necessary that this will be so soft as to be fully pliable to generally act in the manner described. We have found that an alloy of lead and zinc with 20% of zinc acts very efficiently in the manner described, tests showing that a member as described can withstand 27,800 lbs. on a one inch bolt system, breaking the bolt, but in no way

disturbing the form or condition of the lead of the anchorage medium, while the rigid shell type only withstands from 4,500 to 6,500 lbs.

We do not limit ourselves to the means shown in the drawings, which show one form in which the property of lead or other substance under complete restraint may be applied to a special and useful purpose, since changes may be made in the mechanical parts and the principle of the invention still be retained as disclosed herein and as set forth in the appended claims. The structure forms the subject matter of our separate application, Serial Number 613,627, to which reference is hereby made, the present claims relating only to the new method or art of anchoring, and not to the structure by which that method may be carried out.

Having thus described our invention, we claim as new and desire to secure by Letters Patent:—

1. In the art of anchoring a bolt in a hole in a wall in which an expanding member whose greatest diameter is substantially that of the hole and which is held against longitudinal movement on the bolt, engagingly enters into an expansible member, said expansible member being intermediate the expanding member and the wall of the hole, and being expanded and pressed outwardly against said wall by the expanding member, that step which consists in spreading the area of application of the expanding force, from the portion to which it is initially applied, to consecutive portions of the expansible member, said expanding force pressing the entire expansible member outwardly against the wall only at the completion of the expansion.

2. In the art of anchoring a bolt in a hole in a wall in which an expanding member whose greatest diameter is substantially that of the hole and which is held against longitudinal movement on the bolt, engagingly enters into an expansible member, said expansible member being intermediate the expanding member and the wall of the hole, and being expanded and pressed outwardly against said wall by the expanding member, that step which consists in spreading the area of application of the expanding force, from the portion to which it is initially applied, to consecutive portions of the expansible member, said expanding force pressing the entire expansible member outwardly against the wall only at the completion of the expansion, said expansible member being maintained stationary during its expansion and having its material under complete restraint from being moved out of the region of pressure upon the application of the said pressure.

3. In the art of anchoring a bolt in a hole in a wall in which an expanding member

whose greatest diameter is substantially that of the hole and which is held against longitudinal movement on the bolt, engagingly enters into an expansible member, said expansible member being intermediate the expanding member and the wall of the hole, and being expanded and pressed outwardly against said wall by the expanding member, that step which consists in maintaining the
5 expansible material under complete restraint from being moved out of the region of pressure upon the application of the said pres-

sure and confining all the moldable material while under restraint.

In testimony, that we claim the foregoing as our invention, we have signed our names in presence of two subscribing witnesses. 15

GABRIEL E. ROHMER.
J. FRANCIS BOORAEM.

Witnesses:

JOHN MURTAGH,
L. J. MURPHY.